DRAFT Removal Recommendation for Added Costs to Agriculture and Industry Beneficial Use Impairment
June 8, 2009

Rochester Embayment Area of Concern

Request

The purpose of this document is to support the recommendation to remove the Added Costs to Agriculture and Industry Beneficial Use Impairment (BUI) from the Rochester Embayment Area of Concern (AOC), per the process outlined in *Restoring United States Great Lakes Areas of Concern: Delisting Principles and Guidelines* (U.S. Policy Committee 2001).

Rochester Embayment AOC Background

The Rochester Embayment AOC encompasses the Rochester Embayment of Lake Ontario (the area of shoreline between Bogus Point in the town of Parma and Ninemile Point in the town of Webster). The northern boundary is delineated by a straight line between these two points. The AOC also includes the 6 miles of the Genesee River from the Lower Falls to the mouth of the river at the Embayment (see Figure 1).

The Rochester Embayment Remedial Action Plan (RAP) process began in 1990 and resulted in the production of the Stage I RAP in 1993, identifying existing conditions and data for each BUI in the AOC, as well as identifying each BUI as impaired, not impaired, or unknown. Subsequent to the issuance of the Stage I report, a Stage II RAP was published in 1997, and an update to the Stage II RAP was published in 1999, which was then followed by a 2002 RAP addendum. These documents assess existing conditions, highlight activities to improve AOC conditions implemented to date, and identify and rank programs to address BUIs. Delisting criteria were first developed in the 2002 RAP addendum.

The intent of the AOC program is to remedy the impairment when the AOC is the source. The status of each BUI (impaired, not impaired, or unknown/needs further assessment) for the Rochester Embayment AOC was originally determined during the Stage I RAP process (Monroe County 1993). When the Stage I RAP was written, impairments were determined by looking at conditions on a watershed-wide basis. Studies since Stage I have identified lakewide impairments that do not originate from pollutants (or other causes of impairments) within the Rochester Embayment AOC watershed. However, the official status has not been officially changed to consider AOC sources only.

In March 2009, Ecology and Environment, Inc. (E & E) issued the *Rochester Embayment Area of Concern Beneficial Use Impairment Delisting Criteria Report* in support of the Rochester Embayment RAP Oversight Committee (Rochester Embayment RAP OC), the Rochester Embayment RAP Coordinator, the United States Environmental Protection Agency (EPA) Region 2 and Great Lakes National Program Office (GLNPO), and the New York State Department of Environmental Conservation (NYSDEC). The Report establishes delisting criteria and delisting targets for the 14 impaired and unknown BUIs in the Rochester Embayment AOC designated as such in 1993.

The status of those BUIs with lakewide use impairments, for which local actions will have minimal remedial impact on those pollutants causing the impairments, which include the Added Costs to Agriculture and Industry BUI, are being reconsidered in 2009. Ultimately, the delisting

of BUIs is a recommendation that must be made by the Rochester Embayment RAP OC based on review of monitoring data, with the ultimate approval of NYSDEC, EPA Region 2 and GLNPO. This report provides information to support the justification for the delisting of the Added Costs to Agriculture and Industry BUI.

Initial Rationale for Impairment of Added Costs to Agriculture and Industry

The Stage I and Stage II RAPs indicate that zebra mussels (*Dreissena polymorpha*) in Lake Ontario and the Lower Genesee River have resulted in extra water treatment costs, primarily for industrial and municipal water users. Two industrial and one municipal intake were identified in the Stage II RAP in the Rochester Embayment: Rochester Gas and Electric (RG&E) (now owned by Iberdrola), Eastman Kodak and the Monroe County Water Authority (MCWA) (see Figure 2). The start-up cost to the MCWA for installation of a control system at its water intake for zebra mussels was $800,000. The start-up cost to the RG&E Corporation for installation of control systems for cooling water at two generating stations was $170,000. In addition to installation costs, there are operating and maintenance costs. Agricultural costs related to zebra mussels were not identified in Stage I as the Monroe County Cooperative Extension reported no record of added costs of agriculture due to pollution. Zebra mussels can pose a high cost to agriculture if Rochester Embayment water is used for irrigation; however, there are no known agricultural withdrawals from the AOC in 2009 according to the Monroe County Soil and Water Conservation District (Myers 2009).

Since the development of the Stage II RAP the quagga mussel (*Dreissena bugensis*), an invasive freshwater mollusk native to eastern Europe and of the same genus as the zebra mussel, has risen to the position of dominating the food web niche formerly occupied by zebra mussels in a relatively short period of time. Quagga mussels are capable of surviving at greater depths and larger temperature ranges than zebra mussels and will colonize both hard and soft substrates, while the zebra mussel specifically colonizes hard substrates (Mills et al. 1996 and 1999). While the original listing of the impairment was due to the presence of zebra mussels within the Rochester AOC and the resulting economic impacts to industrial and municipal users, the impairment can now be generalized to encompass both species. The zebra mussel and quagga mussel both continue to proliferate in Lake Ontario; however, studies show that there is a gradient of dominance across the southern shore of Lake Ontario with quagga mussels more dominant than zebra mussels at western sites along the south shore of Lake Ontario (including Olcott, Thirty Mile Point, Hamlin, Rochester Embayment and Smoky Point) compared to eastern sites along the southeast shore of Lake Ontario (Fair Haven, Nine Mile Point and Mexico Bay) (Mills et al. 1999).

Delisting Criteria and Monitoring Methods

The International Joint Commission (IJC) set forth delisting guidelines for AOCs to uses as a basis for developing their delisting criteria. The IJC delisting guideline for Added Costs to Agriculture and Industry is

> *When there are no additional costs required to treat the water prior to use for agricultural purposes (i.e., including, but not limited to, livestock watering, irrigation and crop-spraying) and industrial purposes (i.e. intended for commercial or industrial applications and noncontact food processing).*

According to the EPA-approved *Rochester Embayment Beneficial Use Impairment Delisting Criteria Report* (E & E 2009), the Added Costs to Agriculture and Industry BUI will be restored when the following delisting criteria are met:

1. Current scientific literature indicates that zebra mussel is a Great Lakes-wide problem; and

2. The Rochester Embayment AOC does not contribute to the presence of zebra mussel in the Rochester Embayment.

The monitoring method originally developed for this BUI consists of review of scientific literature on an ongoing basis to determine if the Rochester Embayment watershed may contribute to the zebra mussel problem.

The intent of the RAP program is to remedy the impairment when the AOC is the source; as such, the intent of this delisting recommendation is to show that the Rochester Embayment AOC is not the source and is not significantly contributing to the continuing spread and high numbers of zebra and quagga mussels.

Assessment of Information to Support Delisting of the BUI

Zebra mussels were first documented in the Great Lakes ecosystem in the late 1980s (Mills et al. 1999). Quagga mussels were first documented in the Great Lakes ecosystem in September 1989 near Port Colborne, Lake Erie (Bensen et al. 2009). Zebra mussels spread rapidly in Lakes Erie and Ontario and were identified in Lake Superior, Lake Huron and Lake Michigan as early as 1993 (Kraft 1993). By 1996, the quagga mussel had spread through Lakes Erie and Ontario and the St. Lawrence River (Mills et al. 1999, Watson et al. 1999, Nalepa et al. 2001).

The occurrence of these species in Lake Ontario and the entire Great Lakes ecosystem is widely documented (see Figure 3). Both species are now prevalent in all five Great Lakes (Nalepa et al. 2001, Watson et al. 1999), with occurrences of quagga mussels in the upper Great Lakes on the rise since 1999 (Fleischer et al. 2001). In Lake Ontario, a 1999 study identified that Olcott (located at the mouth of the Eighteenmile Creek AOC) and Rochester Embayment AOC, in addition to Thirty Mile Point, Hamlin and Smoky Point (non-AOCs) all had both quagga and zebra mussels in 1992 and 1995, and the densities of quagga mussels increased between years (1992 to 1995) at almost all depths at all sites. Other locations not identified as AOCs on Lake Ontario were sampled across these years (Fair Haven, Nine Mile Point and Mexico Bay) and the sampling results clearly exhibited an increase in both species across study years, although the quagga mussel was less dominant at these sites (Mills et al. 1999). This study of invasive species mussel biomass and distribution at multiple sites across years indicates that the presence and numbers of zebra and quagga mussels in Rochester Embayment is not unique compared to other locations in Lake Ontario. Likewise, the Rochester Embayment AOC is not likely the source or a contributor to the impairment of Added Costs to Agriculture and Industry given the historic and continuing lake-wide presence of these species.

Zebra and quagga mussels are both native to European nations and are believed to have been introduced into the Great Lakes as a result of ballast water discharge from foreign ships entering the Great Lakes system (Mills et al. 1996 and 1999, Wilson et al. 1999, Benson et al. 2009). However, the rapid spread of these organisms is attributed to other factors including larval drift

into freshwater river systems, causing mussel colonization in tributaries to the Great Lakes ecosystem, including the Genesee River (Bensen et al. 2009). Further, fishing and boating activities are identified as a primary cause of the rapid colonization of these species, which allow for the mussels to be transported over land to other freshwater systems (Watson et al. 1999, Bensen et al. 2009). Both species have been found attached to hard substrates, including the hulls of ships, and transport by boat movements overland are believed to be the primary causes for both species prevalence in the upper Great Lakes (Lakes Superior, Michigan and Huron) (Watson et al. 1999).

There is no evidence that the Rochester Embayment or any other tributary to the Great Lakes is a geographically unique source of zebra or quagga mussels to Lake Ontario. These species are well-established lake-wide and as a result have impacted water intakes in Rochester Embayment and elsewhere in Lake Ontario and other Great Lakes, making it a misnomer to identify the Rochester Embayment AOC as being impaired for this BUI. While the Rochester Embayment AOC has water intake and ecosystem problems that can be directly linked to invasive mussel species abundance, the Embayment is not the cause of these species' proliferation. Additionally, other New York State AOCs do not consider the proliferation of zebra and quagga mussels in the Lake to be a source of added costs to agriculture and industry within their AOCs, even though the obstruction of water intakes is a widely reported impact of invasive mussels, particularly zebra mussels (Benson et al. 2009). St. Lawrence at Massena AOC, Niagara River AOC and Eighteenmile Creek AOCs are all listed as not impaired for this BUI, while Buffalo River has listed this BUI as not applicable (EPA 2008). These AOCs likely attribute issues linked to invasive zebra and quagga mussels to lake-wide impairments. This is further supported through the Lake Ontario Lakewide Mangement Plan (LaMP) 2008 Update (LaMP 2008a).

The literature, including the 2008 LaMP Update indicate that the spread and proliferation of zebra and quagga mussels are much more than an added cost to agriculture and industry in Lake Ontario. These species are impacting food web dynamics, changing the way that nutrients are cycled and as a result, increasing the growth of *Cladophora* and other bottom growing algae, threatening efforts to restore native fish and promoting blue-green algal blooms. The Binational Collaborative Research and Monitoring Initiative is a data gathering mission initiated by the LaMP in the 2008 field season to study lake-wide issues associated with the role of invasive mussels in nutrient cycling (LaMP 2008, 2008a).

At the time of the Stage II RAP, the fact that zebra mussels were present throughout the Great Lakes and tributaries was already widely known and included as an assumption. The delisting criteria was written so that the BUI would be delisted when there is definitive proof through literature that the Rochester Embayment is not a cause of the impairment. The literature published to date indicates that tributaries to the Great Lakes Ecosystem do not contribute to zebra or quagga mussel proliferation, and that in fact historic introduction of these species and the subsequent spread through drift and boat use are the primary cause for the invasive mussel species impairment throughout the Great Lakes ecosystem.

Rationale for Delisting

The intent of the AOC program is to remedy the impairment when the AOC is the source. Studies prior to and since the original status determination of this BUI have identified that zebra and quagga mussels are a Lake Ontario- and Great Lakes-wide impairment. Zebra and quagga mussels have been identified as the only source of impairment to added costs to agriculture and in-

dustry in the Rochester Embayment; however, there is no known literature that identifies the Rochester Embayment AOC as an original source of zebra or quagga mussel infestation. As such, each delisting criteria is met in the following manner:

1. **Current scientific literature indicates that zebra mussel is a Great Lakes-wide problem**

   As discussed above and shown in Figure 3, the zebra mussel and quagga mussel are widely documented as a Great Lakes-wide invasive species issue.

2. **The Rochester Embayment AOC does not contribute to the presence of zebra mussel in the Rochester Embayment.**

   The cause of zebra and quagga mussel presence in the Rochester Embayment is widely recognized as a lake-wide issue. The contributors to the presence of these species in the Embayment has been identified as an initial introduction into the Great Lakes ecosystem through ballast water, with the rapid spread of the species resulting from larval drift and boat/ship movements.

Not only have zebra and quagga mussels been identified in all five Great Lakes, they were both first discovered in North America in Lake Erie. The Rochester Embayment AOC has never been attributed as a source of either species. As such, it can be reasonably deduced that the Rochester Embayment AOC is not the source of the Added Costs to Agriculture and Industry BUI and should be delisted.

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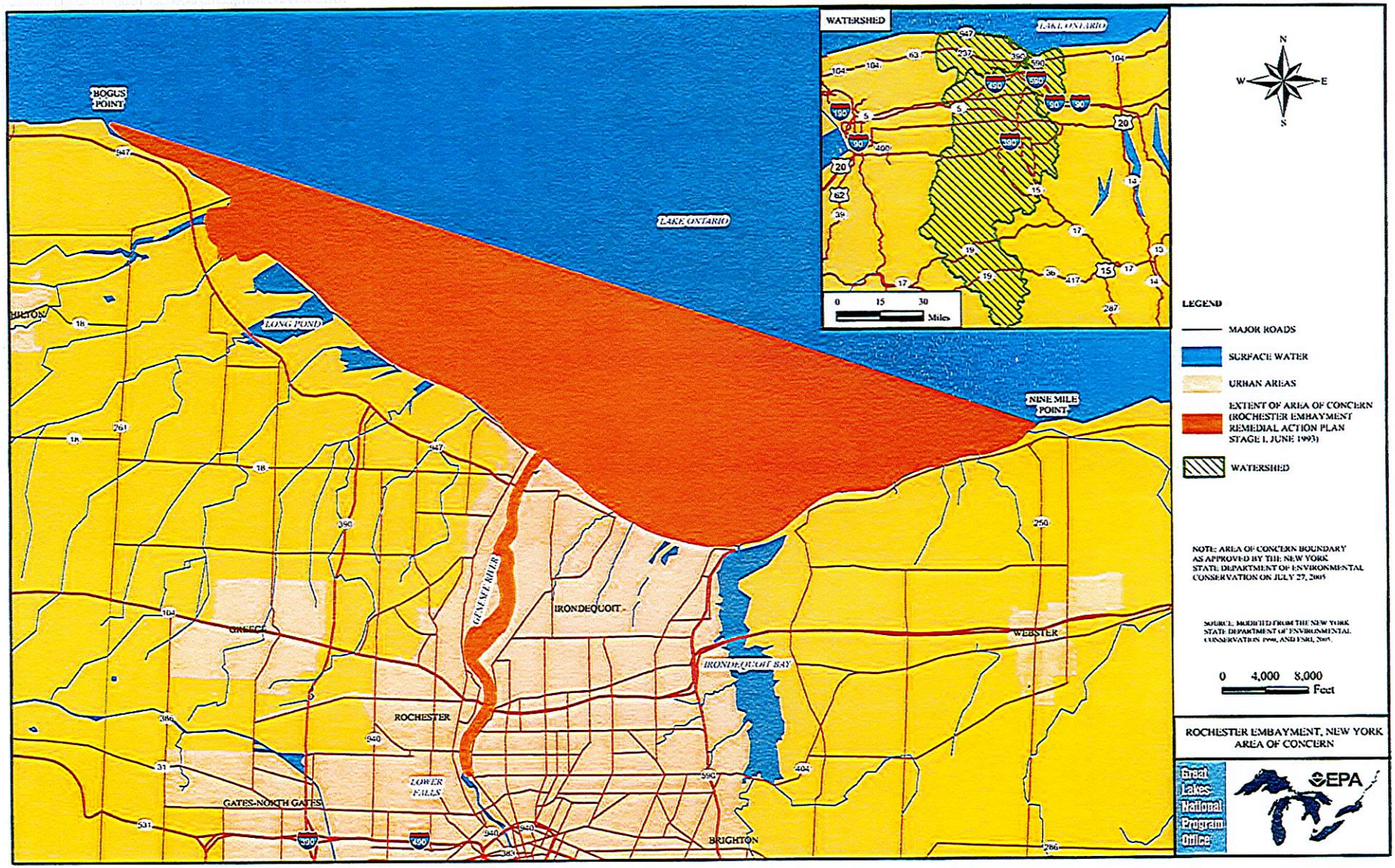


Figure 1 Rochester Embayment, New York Area of Concern

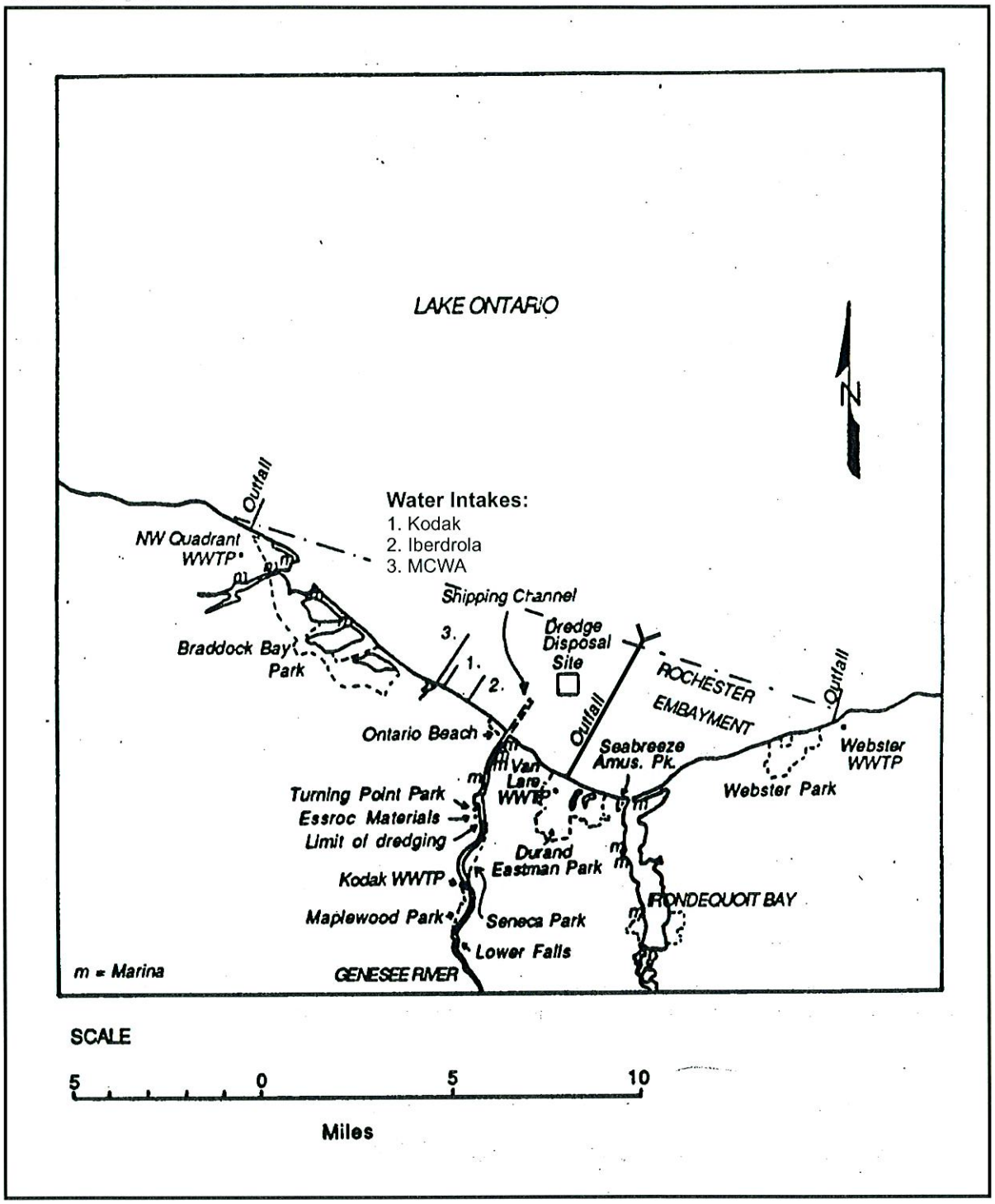
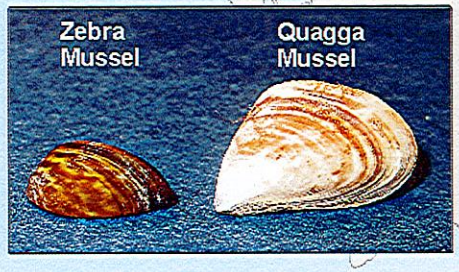


Figure 2: Intake and Outfall Locations in the Rochester Embayment
Modified from Monroe County 1993

Figure 3

Zebra and Quagga Mussel Sightings Distribution

Dreissena polymorpha and D. rostriformis bugensis



- Zebra mussel occurrences
- Quagga mussel occurrences
- Both species occurrences
- Mussels trailered overland on boat hulls

Map produced by the U.S. Geological Survey, Gainesville, Florida, April 22, 2009.

http://nas.er.usgs.gov/taxgroup/mollusks/zebramussel/maps/current_zm_quag_map.jpg